Production, utilization and markets for root and tuber crops in Brazil

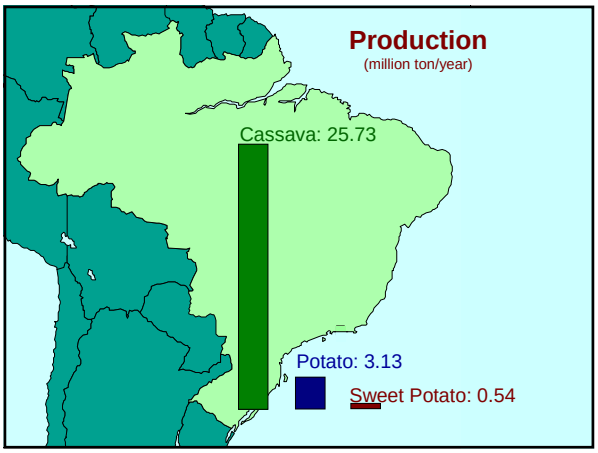
Carlos E. Leite Cardoso and Wania M.G. Fukuda
(EMBRAPA-Brazil)

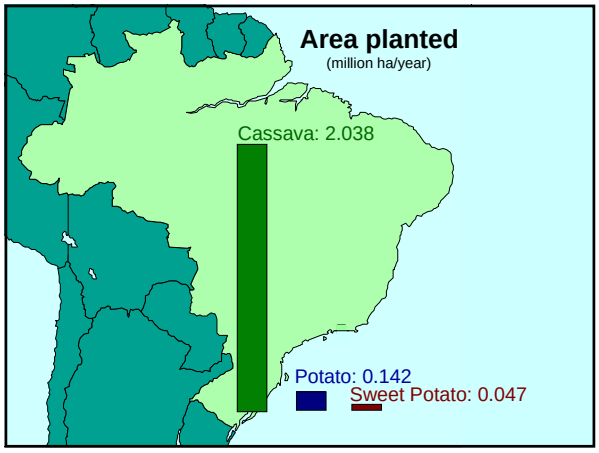
Statistics of root and tubers crops in Brazil

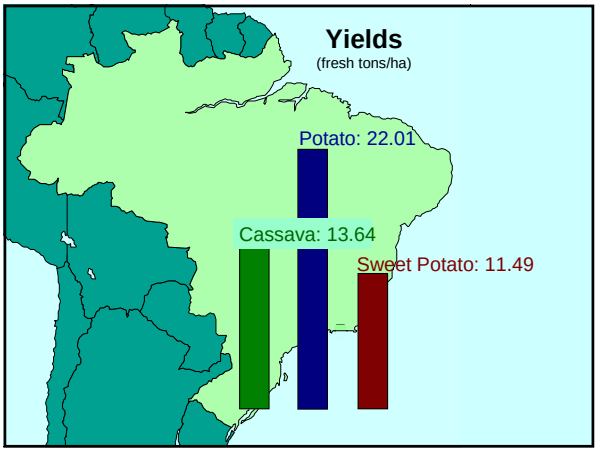
Cassava in the world and Brazil

The starch production chain in Brazil

Ministério da Agricultura, Pecuária e Abastecimento







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Embrapa

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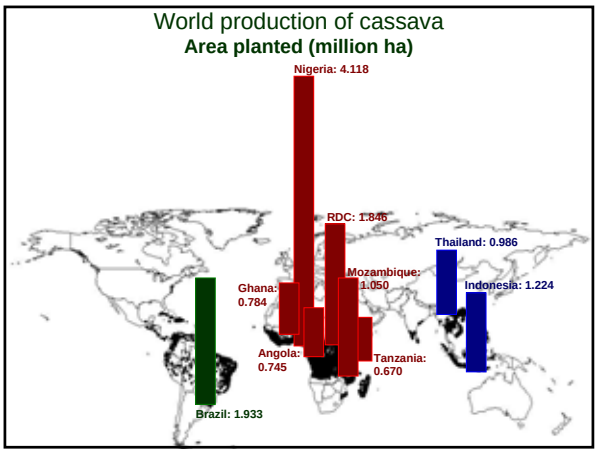
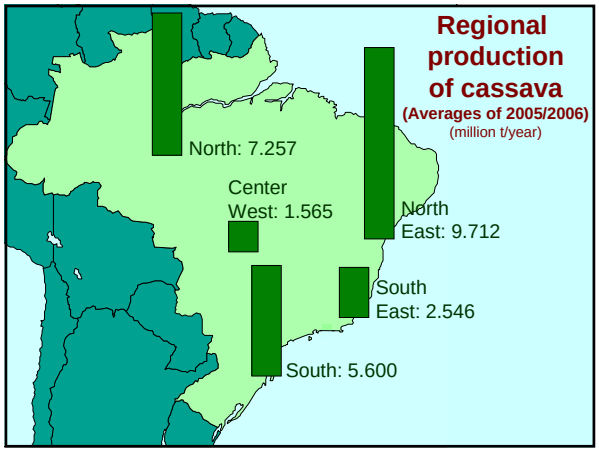
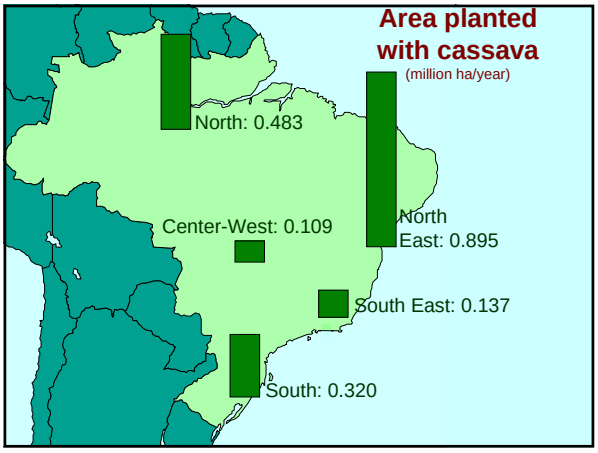
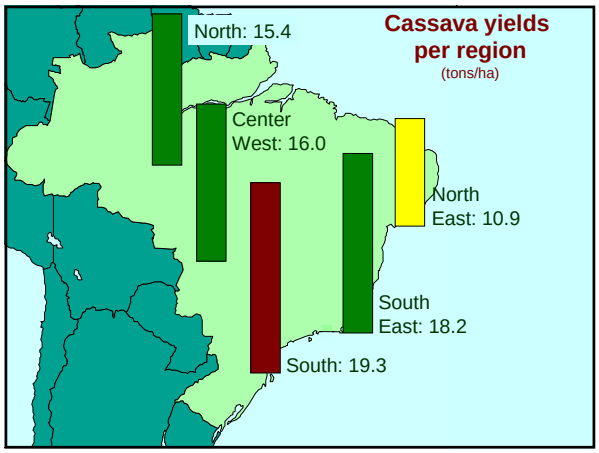
BRASIL UM PAÍS DE TODOS









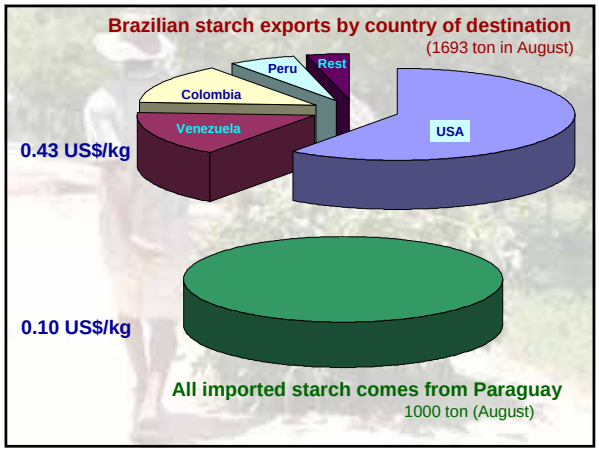
Domestic prices of relevant cassava products in Brazil

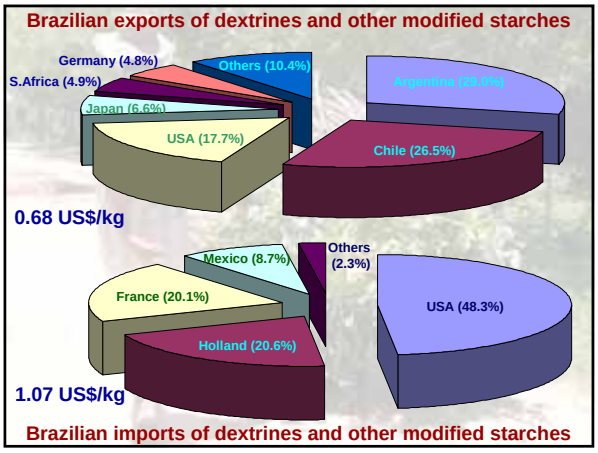
Roots = 79.76 R$/t

Starch = 576.37 R$/t

Farinha (smooth) = 454.20 R$/t

Farinha (rough) = 477.25 R$/t





Exports of fresh, refrigerated, frozen or dried roots (530 US$/ton):
- **Holland = 67%**
- **USA = 29%**
- **Uruguay = 4%**

Imports of fresh, refrigerated, frozen or dried roots (30 US$/ton):
- **Paraguay = 100%**

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Making the production chain of cassava starch more competitive in Brazil

Efficient use of resources by all the agents in the chain

Coordination instruments for adequate transmission of information, stimuli and control factors (efficiency)

Able to meet current and potential market demands, particularly in relation to price, volume and quality (efficacy)

Factors that limit the competitiveness of the cassava starch production chain

Factors related to the demand

Subsidies in foreign markets

Restriction to importation by USA and EU

Subsidies to domestic productions in USA and EU favor maize and potato starches

About 40% of total production of starch in Europe benefits from "production refunds"

Starch industry in USA/EU has capacity to modify their starches, which further make local crops more competitive

However, trends to avoid modified starches in food and environmental concerns provide an opportunity

Asymmetry in information

In spite of advantages of cassava starch for certain markets, a lack of information about it, decrease its competitiveness and, ultimately, reduces demand

A typical example is the case of baking industry replacing wheat flour

> "Starch sector is one of the most closed ones. Most of the research is carried out by the private sector where most patents arise. This situation limits the development of new enterprises or the survival of small/middle sized ones…" (Cereda, 2001)

Strong link between consumers demand and technological developments before and during the process of creation of modified starches and analysis of their specific uses

Instability of quality / cyanide concerns

Variation in starch quality is a matter of concern, although this situation has improved in the last few years in Brazil

Root quality in cassava is affected by the environment and cultural practices. Sriroth et al. (2000) suggest the need to analyze how all these factors ultimately affect starch quality

Japan does not accept HCN values above 1 mg/kg

If the external markets are to be increased, there is a need for all the agents to be aware of demand requirements

Quality and price are important and play different roles:
Adhesives and wood-related industries = price
Paper and textile industries = price and quality
Food industry = quality

Factors that limit the competitiveness of the cassava starch production chain

Factors related to the demand

Technological limitations (field and factory)

Soil management

Restrictions in crop rotation

Limited (but increasing) use of minimum tillage

Limited use of contour planting or terrace formation

Lack of understanding of soil status when different crop rotations are implemented. Lack of fertilization packages for each production system.

Conflicts between owners and farmers lead to inadequate fertilization process

Limited utilization of soil analysis

Germplasm

High-yielding clones have been developed, but planting material may not be sufficient

Need to increase starch content in roots

Need to increase stability of dry matter and starch content in the roots

Need to develop clones with roots that are easy to peel and have low HCN levels

Mid-sized roots, with white and smooth skin and erect plant architecture are desirable. Smooth skin is important for the processing plant (less soil carried by the root)

Germplasm (cont.)

Low multiplication rate limits adoption of new clones and promotes the movement of planting material between regions

Need to diversity harvesting times

Need to develop storage methods for planting material

Need to teach farmers about adequate approaches to harvest, store and treat the planting material

Combining clones with different optimal harvesting time encourages farmers to plan activities > better management

Planting system / cultural practices

Increasing use of mechanical planting (particularly in the South)

Need to develop new planting machines, with more than two rows

Improvement of minimum tillage planting machines and systems

Need to analyze different herbicides and other different chemical products occasionally required by cassava

The most significant problems are CBB, horn worm and drought in the northeast

Harvest

Mechanization of harvest has also increased in the last few years

However, further improvement in the mechanization of harvest are required to reduce costs

Mechanical harvest may have negative effects in certain types of soil

From the processors perspective: environmental constraints

Lack of alternatives for managing the wastes of starch production

Lack of application of the alternatives already available by processors with negative impact on environment

Intensive use of water. Advisable to recycle the water used for starch extraction in washing the roots

Need to increase profit by exploiting sub-products.

From the processors perspective: industrial yields

The extraction process can be improved enhancing its efficiency or acquiring new equipments

Investment in new equipment is limited because of lack of knowledge (small scale factories), and skepticism that return of investment will happen in the short term

Cardoso et al. (2001) estimated that for each increase in 1% in starch extraction there will be an increase of 2% in the profit of the entire production chain.

From the processors perspective: improving traditional processes

Process to produce fermented starch needs improvement

Is it possible to produce similar products by non-biological methods (i.e. addition of lactic acid)?

Factors that limit the competitiveness of the cassava starch production chain

Factors related to the demand

Technological limitations (field and factory)

Structural and systemic limiting factors

Structural and systemic limiting factors

Relate to elements that are external to the production chain or cannot be controlled by some of its agents but, nevertheless, affects its competitiveness

Price of the products. Scale of the processing facilities. Relationship between farmers and processors. Relationship and inter-dependence between starch and farinha markets

Government policies. Taxes. Impact of organizations related to the chain (lobbying). Agrarian structure and availability of labor

Competitiveness of starches from different crops. Bulkiness and short shelf life of cassava roots

Structural and systemic limiting factors

Progress in the contracts between farmers and processors

Need to develop a fair system to reward high quality in the roots

Asymmetry in the management of information about prices

Factory management shifts from familiar-informal to more business-oriented and efficient

Lack of farmers organizations

Qualitative indicators of starch competitiveness based on source of raw material

INDICATORS	Maize	Wheat	Potato	Waxy Maize	Cassava
Crop productivity	+++	+++	+++	+++	+
Potential to increase productivity	++	+	++	+	+++
Price of raw material	+++	++	+	+++	++
Flexibility to obtain raw material	+++	+++	++	+++	+
Starch conversion factor	+++	++	+	+++	++
Easy to extract starch	++	++	+++	++	+++
Value of sub-products	++	+++	+	++	+
Cost of waste management	+	+	++	+	+++
Price of starch	+++	++	+	++	++
Potential for the food industry	++	++	+++	+++	+++
Potential for other industries	+++	+++	++	++	++

(+++) High; (++) Intermediate; (+) Low; (-) Absent

Qualitative indicators of starch competitiveness based on source of raw material (cont.)

INDICATORS	Maize	Wheat	Potato	Waxy Maize	Cassava
Potential as sugar substitute	+++	++	+	+++	++
USA / EU policies	+++	+++	+++	+++	-
Advances in P& D	+++	+++	+++	+++	+
Technological opportunities	+++	+++	+++	+++	+
Private sector in agric.sector	+++	+++	++	+++	+
Accumulation capacity	+++	+++	++	+++	+
Organization of prod. chain	+++	+++	+++	+++	+

(+++) High; (++) Intermediate; (+) Low; (-) Absent